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**TITLE: IMPROVED STRAP TENSIONER**

This is a utility patent application which claims benefit of U.S. Provisional  
Application No. 60/409,747 filed on September 11, 2002.

**BACKGROUND OF THE INVENTION**

1. Field of the Invention:

This invention relates to devices used to tighten a strap, and more particularly, to such  
devices that enable the user to apply greater tension to the strap.

2. Description of the Related Art:

Adjustable buckles used to tighten a strap around an object or to attach the ends of  
two straps together are very common. Typically, such buckles include an outer frame made  
of metal or plastic with one or more transversely aligned round pins that the loose end of the  
strap wraps around and binds against to hold the strap at a desired tension or length. In order  
to tighten the strap, the loose end or "bitter end" of the strap must be pulled in a direction

1 opposite the direction to the strap. Unfortunately, the user is often unable to grip the loose  
2 end of the strap sufficiently to tighten the strap to the desired length or tension, or the buckle  
3 is unable to hold its grip and is slowly pulled towards the loose end of the strap. Even when  
4 the working end of the strap could be tightened to the desired length or tension, it is often  
5 difficult to loosen the strap from the buckle.

6 What is needed is an improved strap tensioner that enables a user to apply greater  
7 tension to one or two straps and to easily loosen the strap.

## 8 9 **SUMMARY OF THE INVENTION**

10 It is an object of the present invention to provide an improved strap tensioner used to  
11 manually apply greater tension to a strap than a standard buckle.

12 It is another object of the present invention to provide such a device that enables the  
13 user to easily tighten the strap to the desired amount of tension.

14 It is a further object of the present invention to provide such a device that also allows  
15 the strap to be easily loosened after being shortened or tightened to a desired amount.

16 These and other objects are met by the improved strap tensioner disclosed herein that  
17 is designed to be used with an existing flat strap. The tensioner includes manually operated  
18 tensioning and braking mechanisms coupled together to selectively adjust the tension of the  
19 adjustable working end of a strap.

20 More specifically, the device includes a rigid base upon which the adjustable working  
21 end of a strap is longitudinally extended over. The rigid base includes two parallel,  
22 longitudinally aligned side walls connected together by a front flange member, a rear flange  
23 member, a rear strut and an upper strut. The opposite, non-adjustable working end of the

1 same strap, or the non-adjustable working end of a second strap may be securely wrapped  
2 around the rear strut to securely hold the rigid base in place. Alternatively, an optional hole  
3 may be formed in the rear flange member on the rigid base that receives a suitable connector  
4 that securely mounts the rigid base to a rigid surface.

5 Mounted inside the rigid base is a biased tension lever, a biased intermediate member,  
6 and a biased brake lever. The tension lever is longitudinally aligned inside the rigid base and  
7 pivotally connected to the intermediate member via a first pin. The tension lever is biased in  
8 the rearward direction which, during use, rotates upward approximately 90 degrees over the  
9 proximal end of the rigid base to the rigid base's mid-line axis. Formed on the distal end of  
10 the tension lever is a transversely aligned clamping flange that extends under the intermediate  
11 member and under a strap when longitudinally aligned over the rigid base.

12 The intermediate member is transversely aligned inside the rigid base and elevated  
13 slightly over the clamping flange on the tension lever. The tension lever is biased rearward in  
14 a rearward direction also called its opened position. The intermediate member is pivotally  
15 connected between the two sidewalls on the rigid base via a second pin. The intermediate  
16 member is also biased in the rearward direction, hereinafter called its closed position. The  
17 intermediate member and the tension lever include interlocking surfaces that enable them to  
18 rotate together when the tension lever is manually rotated in the forward direction.

19 Formed on the front lower surface of the intermediate member is a curved first cam  
20 surface. When the intermediate member is in its closed position, the first cam surface is  
21 spaced above the clamping flange on the tension lever thereby enabling a strap to slide  
22 longitudinally over the rigid base. When the tension lever is gradually rotated in a forward  
23 direction, the space between the first cam surface and clamping flange narrows and

1 eventually pinches against the strap. When the tension lever is further rotated in a forward  
2 direction, the intermediate member is engaged by the tension lever and also begins to rotate  
3 in the forward direction.

4 The brake lever is longitudinally aligned and pivotally attached between the two side  
5 walls directly in front of the intermediate member. The brake lever is biased in the rearward  
6 position, hereinafter called its closed position, and is designed to rotate in a forward direction  
7 in a 90 degree arc over the distal end of the rigid base into an opened position. Formed on  
8 the lower end of the brake lever is a second cam surface that is located directly above the  
9 rigid base's front flange member. When the brake lever is rotated rearward into the closed  
10 position, the second cam surface is forced downward and presses tightly against the strap  
11 thereby preventing the strap's longitudinal movement over the rigid base. When the brake  
12 lever is rotated forward to an opened position, the second cam surface rotates upward thereby  
13 releasing the strap and allowing its longitudinal movement over the rigid base.

14 During operation, the end of a non-adjustable working section of the strap is securely  
15 attached around the rear strut on the rigid base. Alternatively, the rigid base may be mounted  
16 onto a rigid surface. The brake lever is rotated to its opened position so that the loose end of  
17 the strap may be longitudinally aligned over the rigid base and inserted into the narrow slot  
18 formed between the second cam surface and the front flange member. The adjustable  
19 working end of the strap is then further extended longitudinally over the rigid base and  
20 through the space formed between the first cam surface and the clamping flange, under the  
21 tension lever and through the proximal end of the rigid base. When the tension lever is  
22 rotated to its closed position, the tension lever engages the intermediate member and binds  
23 the first cam surface against the strap. As the tension lever is further rotated in the forward

1 direction, it then eventually contacts the upper section of the brake lever and causes the brake  
2 lever to slightly move to an opened position so that the strap may slide freely under the brake  
3 lever. When the tension lever is completely rotated in a forward direction, the strap may be  
4 pulled longitudinally over the rigid base. When the tension lever is rotated in the rearward  
5 direction and returned to its opened position, the brake lever closes and binds the strap again.  
6 When the tension lever is rotated in the forward direction again, the brake lever is released  
7 and additional strap is pulled over the rigid base.

8 Because the tension lever and intermediate member are selectively engaged to bind to  
9 the strap, the user may easily use the tension lever to quickly pull the strap through the slot  
10 formed between the second cam surface and the flange member. Because the brake member  
11 is biased in a closed position to hold the strap as the tension lever is moved in a forward  
12 direction, the strap is prevented from being pulled back through the rigid base as the strap is  
13 tightened. Also, because the brake lever is biased in the closed position, the strap may be  
14 easily loosened by rotating the brake member forward to the opened position. Because the  
15 tension lever can be used to open the brake lever, the user may intermittently loosen the strap  
16 by rotating the tension lever to tap or slightly move the brake lever between closed and  
17 opened positions.

18 In summary, the improved strap tensioner allows the user to easily tighten a strap by  
19 simply moving the tension lever back and forth over the rigid base. Because the tension lever  
20 may be selectively bound to the strap, and because the brake lever prevents the strap from  
21 being pulled through the rigid base, greater tension may be applied to the strap of the strap  
22 tensioner than to a standard buckle. The user may easily loosen the strap by simply moving  
23 the brake lever to the unlocked position or by using the tensioning lever to intermittently

1 control the brake lever.

## 3 DESCRIPTION OF THE DRAWINGS

4 Fig. 1 is perspective view of the improved strap tensioner showing the tension lever  
5 moved in the closed position.

6 Fig. 2 is a perspective view of the improved strap tensioner shown with tension lever  
7 and brake lever both in the opened position.

8 Fig. 3 is a perspective, exploded view of the improved strap tensioner.

9 Fig. 4 is a top plan view of the improved strap tensioner.

10 Fig. 5 is a sectional, right side elevational view of the improved strap tensioner as  
11 shown along line 5-5 in Fig. 4.

12 Fig. 6 is a bottom plan view of the improved strap tensioner.

13 Fig. 7 is a front end elevational view.

14 Fig. 8 is a rear end elevational view.

15 Figs. 9 a – d are side elevational views of the improved strap tensioner showing the  
16 movement of the tension lever, intermediate member, and the brake lever as a strap is pulled  
17 through the device.

18 Fig. 10 is a front elevational view of the intermediate member.

19 Fig. 11 is a rear elevational view of the intermediate member.

20 Fig. 12 is a side elevational view of the intermediate member.

## 22 DESCRIPTION OF THE PREFERRED EMBODIMENT(S)

23 Referring to the accompanying Figs. 1-12, wherein like reference numbers refer to



1 like components, there is shown an improved strap tensioner 10 designed to allow a user to  
2 manually tighten the strap 90 by applying greater tension to a strap 90 than buckles or other  
3 strap tensioners that exist in the prior art.

4 As shown in Fig. 3, the strap tensioner 10 includes a rigid base 12 upon which the  
5 strap 90 is longitudinally extended over. The rigid base 12 includes two parallel,  
6 longitudinally aligned side walls 13, 17 connected together by a front flange member 20, a  
7 rear strut 22, an upper strut 24, and a rear flange member 26. The non-working end 91 of the  
8 strap 90 or one end of a second strap (not shown) is securely wrapped around the rear strut 22  
9 to securely connect the rigid base 12 thereto. The free or working end 92 of the strap 90  
10 enters the distal end and exits the proximal end of the tensioner 10. An optional hole 27 is  
11 formed in the rear flange member 26 that enables the rigid base 12 to be securely attached to  
12 a rigid surface using a suitable connector (not shown).

13 Mounted inside the rigid base 12 is a biased tension lever 30, a biased intermediate  
14 member 45, and a biased brake lever 65. The tension lever 30 is longitudinally aligned inside  
15 the rigid base 12 and pivotally connected to the intermediate member 45. The tension lever  
16 30 includes two parallel, longitudinally aligned side arms 32, 34, a transversely aligned upper  
17 handle 36, a transversely aligned lower clamping flange 38, and a central opening 39 located  
18 between the upper handle 36 and the lower clamping member 38. Formed on the lower ends  
19 of the two side arms 32, 34 are two bores 40, 41, respectively, that receive the pin 80. Also  
20 formed on the upper surfaces of the side arms 32, 34 are recessed nesting surfaces 33, 35 that  
21 receive the ear members 47, 50 formed on the intermediate member 45 when the tension  
22 lever 30 is rotated forward over the intermediate member 45. Formed above the nesting  
23 surfaces 33, 35, are optional stop surfaces 42, 43, respectively, that limit the forward

1 rotational movement of the tension lever 30 over the brake lever 65.

2 Extending transversely between the two side walls 13, 17 is an upper strut 24 which  
3 acts as a stop surface to prevent excess clockwise rotation of the intermediate member 45.

4 As shown in Fig. 5, during assembly the front section of the intermediate member 45 extends  
5 under the upper strut 24.

6 During assembly, a spring 68 is placed around pin 80 that forces the upper handle 36  
7 rearward and over the proximal end of the rigid base 12. During use, the tension lever 30  
8 rotates inside the rigid base 12 moving the upper handle 36 in an approximate 90 degree arc  
9 from the proximal end of the rigid base 12 to the rigid base's mid-line axis 19, (see Fig. 5).

10 During use, the tension lever 30 is positioned so that the clamping flange 38 extends under a  
11 strap 90 aligned longitudinally over the rigid base 12.

12 Also shown in Fig. 3, is an intermediate member 45 transversely aligned inside the  
13 rigid base 12 just in front of and above the clamping flange 38 on the tension lever 30. The  
14 intermediate member 45 includes two ear members 47, 50 as mentioned above. Formed in  
15 each ear member 47, 50 is a bore 48, 51, respectively, that also receives a second pin 85.  
16 During assembly, the second pin 85 is inserted through bores 15, 18 and transversely aligned  
17 between the two side walls 13, 17, respectively, to pivotally connect the intermediate member  
18 45 to the rigid base 12. Formed between the two ears members 47, 50 is a central space 49 in  
19 which a first coiled spring 52 is placed. During assembly, the coiled spring 52 is inserted  
20 around the second pin 85 and used to force the intermediate member 45 in a rearward  
21 direction against strut 24.

22 Formed on the lower section 46 of the intermediate member 45 is a first cam surface  
23 58. When the intermediate member 45 is in its opened position, the first cam surface 58 is



1 spaced apart from the clamping flange 38 on the tension lever 30 so that the strap 90 may  
2 freely slide therebetween. Formed inside the lower section 46 of the intermediate member 45  
3 is a transversely aligned bore 59. During assembly, the first pin 80 is inserted into the bore  
4 59 to pivotally connect the tension lever 30 to the intermediate member 45. A first spring 68  
5 is disposed around the first pin 80 and used to bias the tension lever 30 and intermediate  
6 member 45 in opposite directions. As shown in Figs. 9A-9D, when the tension lever 30 is  
7 initially rotated in a forward direction, the intermediate member 45 is not engaged. As the  
8 tension lever 30 is further rotated, the space between the first cam surface 58 and clamping  
9 flange 38 narrows which enables the tension lever 30 to securely engage the strap 90. When  
10 the tension lever 30 is further rotated in a forward direction, the intermediate member 45 is  
11 completely engaged therewith and begins to rotate in the same direction as the tension lever  
12 30. Because the first cam surface 58 is curved, the strap 90 bends around the first cam  
13 surface 58 which allows the strap 90 to be pulled through the rigid base 12.

14 During operation, the two ear members 47, 50 on the intermediate member 45 are  
15 engaged by the nesting surfaces 33, 35 formed on the tension lever 30 when the tension lever  
16 30 is rotated in a forward direction a sufficient amount. When the tension lever 30 is rotated  
17 approximately 30 degrees, the nesting surfaces 33, 35 receive the ear members 47, 50 thereby  
18 coupling them together.

19 As shown in Figs. 1 – 3, the brake lever 65 is longitudinally aligned and pivotally  
20 attached between the two side walls 13, 17 directly in front of the intermediate member 45.  
21 The brake lever 65 includes a rectangular, curved body 66 with two downward extending ears  
22 67, 70. Formed in each ear 67, 70 is a bore 69, 71, respectively, that receives a lower,  
23 transversely aligned third pin 87 that extends transversely between two bores 14, 16 formed

1 the two side walls 13, 17, respectively. The pin 87 is used to pivotally connect the brake  
2 lever 65 to the rigid base 12. Formed in between the two ears 67, 70 is a central space 73.  
3 Disposed inside the space 73 and around the pin 87 is a second spring 88 used to bias the  
4 brake member 65 in a rearward direction and binds against the strap 90 as shown in Fig. 9A.

5 Formed on the lower end of the brake lever 65 is a second cam surface 75 that is  
6 located directly above the front flange member 20 when assembled. When the brake lever 65  
7 is rotated in a rearward direction, the second cam surface 75 is forced downward to press  
8 against the strap 90 to prevent forward movement of the strap 90 (denoted M(f) in Fig. 9C).  
9 When the second cam surface 75 is pressed against the strap 90, rearward movement of the  
10 strap 90 by moving the tension lever 30 is still permitted. When the brake lever 65 is rotated  
11 in a forward direction, the second cam surface 75 moves upward thereby disengaging the  
12 strap 90 completely and allowing the strap 90 to be moved longitudinally over the rigid base  
13 12.

14 During operation, the non-working end of the fixed strap 90 is securely attached  
15 around the rear strut 22 on the rigid base 12. The brake lever 65 is rotated forward so that the  
16 opposite end 92 of the same strap 90 or one end of a second strap (not shown) may be  
17 inserted into the narrow space formed between the second cam surface 75 and the front  
18 flange member 20. The strap 90 is then further extended through the space until it may be  
19 engaged by the tension lever 30 and the intermediate member 45. The tension lever 30 is  
20 rotated in a forward direction to advance the strap 30 through the rigid base 12. If the  
21 tension lever 30 is rotated in a forward direction to press against the brake lever 60, the brake  
22 lever 60 may be slightly rotated in a forward direction to allow the strap 90 to advance more  
23 freely in the rigid base 12.

1           Because the brake lever 65 binds the strap 90 in one direction and is biased in the  
2 closed position, the strap 30 is temporarily held by the tensioner 10 has the user easily  
3 operates the tension lever 30 to pull the strap 90 through the rigid base 12. Because the  
4 rotation of the tension lever 30 is opposite the direction of the strap 90 through the rigid base  
5 12, the user is able to exert greater force of the strap 30. Because the tension lever 30 is  
6 biased to the disengaged position, the strap 90 may be easily loosened by rotating the brake  
7 member 65 in a forward direction.

8           In summary, the improved strap tensioner 10 allows the user to easily tighten a strap  
9 90 by simply moving the tension lever 30 back and forth over the rigid base 12. Because the  
10 brake lever 65 temporarily holds the strap 90 and prevents it from slipping out of the rigid  
11 base 12, and because the tension lever 30 is rotated in a direction opposite the direction of the  
12 strap 30 when tightened, greater tension may be applied to the strap 90.

13           In compliance with the statute, the invention described herein has been described in  
14 language more or less specific as to structural features. It should be understood, however,  
15 that the invention is not limited to the specific features shown, since the means and  
16 construction shown, is comprised only of the preferred embodiments for putting the invention  
17 into effect. The invention is therefore claimed in any of its forms or modifications within the  
18 legitimate and valid scope of the amended claims, appropriately interpreted in accordance  
19 with the doctrine of equivalents.